MUSICAL INSTRUMENTS

Backstage at the BSO
A Guitarist Plays 20 Questions
Harpsichords: Designing Oldies But Goodies
How to Make Homemade Instruments

Temper, Temper— There's a Better Way To Tune Your Piano

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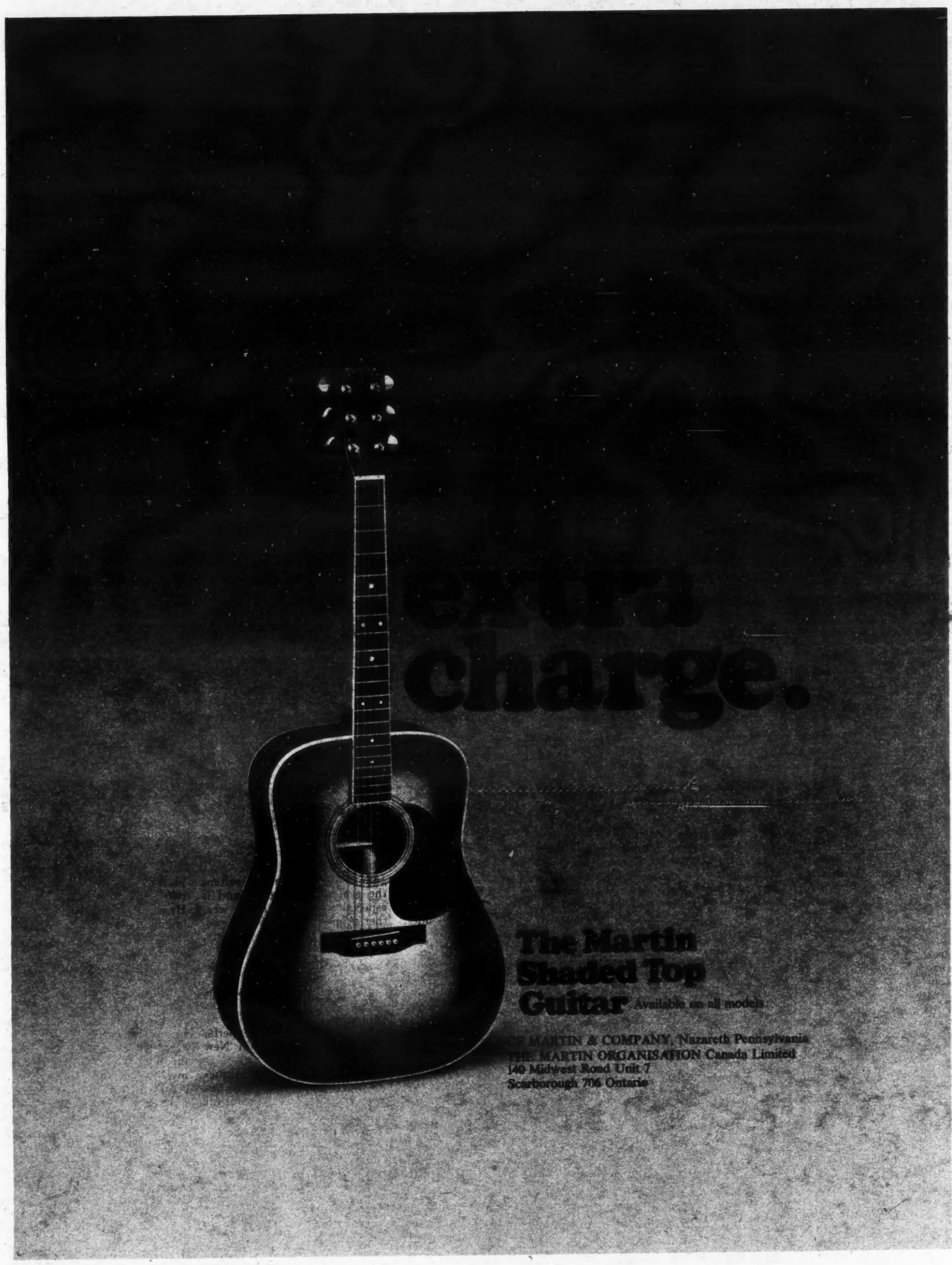
Magazine Supplement to
The Boston Phoenix

Jerry Berndt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Backstage at the BSO: Care and Feeding Is Instrumental

Musical notes on two boys in the band

Photos by Jerry Berndt

Ronald Feldman and Fredy Ostrovsky

By Rory O'Connor

Fredy Ostrovsky says, "I care for it more than I do for myself." Ronald Feldman feeds his horse glue. And rosin. And lemon oil.

Ostrovsky, in his 24th season as a violinist with the renowned Boston Symphony Orchestra, and cellist Feldman, an eight-year veteran at only 27, share several traits despite the disparity in their ages. One is a skilled technique and brilliant intensity in their playing. Another is the attitude of love, devotion and downright humility toward the instrument that is the vehicle of their expression. Each is acutely aware that even top flight musicians are only as good as their axe.

Feldman, who figures that he was most heavily influenced by Leonard Bernstein and Colin Davis, as well as many of the other musicians within the Symphony, likes to compare the properties of the cello to that of the human voice. The ranges of the two are remarkably similar, from the eerily high moans of ecstasy and pain to the steady drone of existence. The instrument is like a fellow human to him.

Ostrovsky is more precise in analyzing his feelings. He claims that although he paid for his instrument, he doesn't really own it. He's merely borrowing it for his lifetime.

*

Casually clad in jeans and sweater, Ronald Feldman is a smiler. He started playing the violin at four and claims to have retired at five because his teacher was too forceful. But his musical career did not end there. Something happened.

"My grandmother loved the cello," Feldman recalls. "I suppose that's a common enough story. And when she died, I started to play it. And I've been playing it ever since."

Now playing the cello is surely no easy matter. And to make matters worse, you have to carry the damn thing around with you. That's why well over 90 percent of the people who quit stringed instruments do so. Or so Feldman says. While there are reliable statistics available to back this up, you get the point. They're just too big to lug around.

And then there's the airlines. You always have trouble with the airlines. Sometimes you can try to fool them, if it's misty or dark and you hold your raincoat over the instrument while you're boarding. You always have to be charming at the airport, says Feldman. ("You see it's just me. And my little friend, of course. But he doesn't take up much room. No really, he can sit on my lap if it's crowded. Aren't there any empty seats on this airplane? It looks only half-full. Yes, of course, I understand. If it gets crowded. Yes. I promise. Oh, thank you, thank you very much. And my cello thanks you as well.")

Other times, they force you to pay half-fare for your instrument. The pattern's irregular. Something to do with karma and what a bitch of a hangover or migraine the people-in-charge have that day. Once, Ronald Feldman's cello was served lunch over Albany.

"It was really incredible," he says. "We were going to Buffalo for a seminar on stringed quartets. When it came time for the food, they made some kind of a mistake and served two lunches to my seat. Or should I say ours?"

Feldman's instrument is a beauty. It was made in 1723 by Dominicus Montagnana, a contemporary of Stradivarius who lived in Venice. It was purchased at an auction in London by the famed dealer and connoisseur Rembrandt Wurlitzer, and Feldman got first crack at it. He naturally declines to put any monetary worth on the instrument, choosing instead to regard the cello as "priceless." This is understandable since a Montagnana is extremely rare, as illustrated by the time-worn joke: "Montagnana made 50 cellows, and all 200 of them are in this country."

Cellos, like all fine stringed instruments, improve with age. There is simply no substitute for 200 years of living. Maple and spruce are the most commonly used woods. Cellos that are being made right this minute are still using wood that is 60 to 70 years old. Exactly why this is remains a musical mystery, but there are many theories.

One of them is that an actual chemical process takes place as a result of vibrations made by the sound of the instrument. The conventional acoustic shape of the molecules that make up the wood undergo a change. There is speculation that actual mini-acoustic chambers are formed when wood molecules break off (due to the vibrations) and trap the sound.

At any rate, it may be desirable for molecules to split, but it certainly isn't for the wood itself. This means that extreme changes in temperature are the major threat to a fine instrument. That's where the horse glue comes in. The glue softens the seams of the cello and is especially beneficial in dry weather. Applying the glue is a process of some skill apparently, and even cellists as proficient as Feldman are advised against caring for one's own instrument. Feldman says he changes the strings and the bridges, cleans and polishes his cello, but leaves major changes to the experts, like Jacques Francais in New York.

Feldman is sure of the uniqueness of his cello not only because of its hauntingly beautiful sound, but also because "this name on the cello is synonymous with quality." Montagnana not only developed his own special way of varnishing his creations, but also made his own acoustic designs, few of which are still available.

Despite all this, Ronald Feldman says that it still takes an expert to really tell an instrument's greatness, that he would "never trust myself to judge." Why? Because cello-making is still a very inaccurate science. Much less accurate than it was hundreds of years ago, in fact. This is one of the few areas of human endeavor where the technology has actually declined over the past two centuries.

For that reason, each of the Montagnanas left in the world has a pedigree longer than any poodle you can find taking first prize at the shows.

*

Fredy Ostrovsky is a short, serious and courteous man with massive forearms and biceps. He places his age with eyes slightly twinkling at "over 50, let's say." He was born in Bulgaria and was originally introduced to music through the rich musical heritage and brooding folk forms of that land. At 16 he graduated from the Vienna State Academy of Music, later studying in London for two years under Carl Flesch. In 1940 he came to the United States and served in the army for three years. "The violin might very well have saved my life," he recalls. "I was originally in the infantry but got pulled out of it in order to play with Glenn Miller's Army Air Corps Band." In 1952 he joined the Boston Symphony Orchestra.

Ostrovsky started playing the violin at the age of six. He doesn't deny that one has to evidence both innate and developed skill to live up to the hundreds of years of exacting tradition behind the music he plays. "You have to have it inside," he says. "You have to feel it. Look at my kids. I tried to get them to start on the violin, but they don't want to take it up. They'd ra-

Continued on page 8

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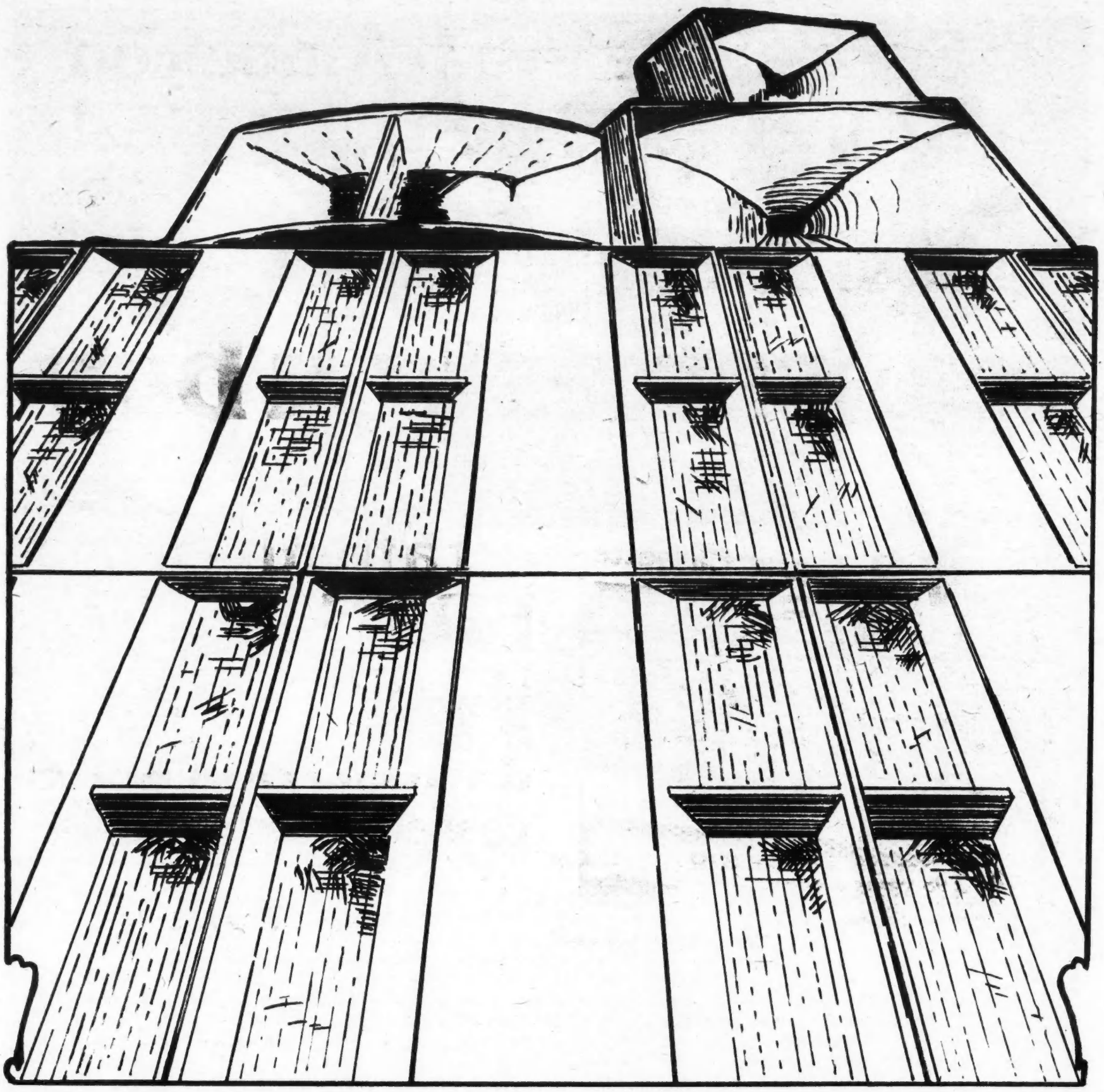

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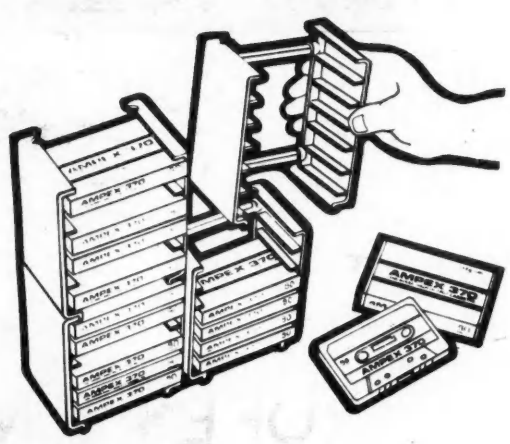

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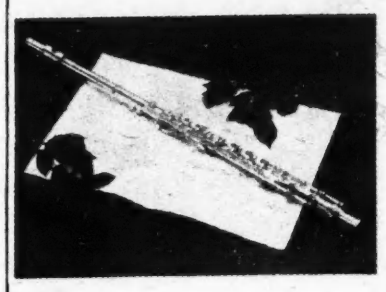

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ther watch TV or play baseball. Or chase girls, you know?"

Ostrovsky's violin is even older than Feldman's cello. It's an Italian instrument made in 1678 by Andreas Guarnerius of Cremona, the northern city that along with Brescia was the home of the geniuses of violin creation such as Amateus and Stradivarius. There, an oral tradition and long apprenticeships enabled the art of making violins to reach its highest degree of perfection, a level that cannot be approached by today's manufacturers.

Ostrovsky's Guarnerius is remarkable to behold. It's a fine, *gen-u-ine* Italian violin with the original varnish still on it. Fredy has managed to trace its ownership as far back as 1900, and one of his favorite fantasies is to imagine that it was once owned by Paganini himself, since it is known that he owned one much like Ostrovsky's.

Fredy purchased his violin about 15 years ago from Moennig and Son in Philadelphia. Ostrovsky says flat out that "Moennig has the best instruments of anyone in the world," and points out that a majority of the 33 BSO violinists bought their instruments there. Moennig, says Ostrovsky, is not only a businessman, but a true connoisseur. He *knows* the violin.

In caring for the instrument, there is always that constant awareness, the fear of the temperature and its fluctuations. Dampness is dangerous. Aridity is awful. Not too cold. Not too hot. Ostrovsky will often not use his Guarnerius in the summer at Tanglewood because of the humidity there. When he thought he detected some problems in the sound, he hopped a plane to Philly and hand-delivered it to Moennig for inspection. The bill for the round-trip flight was more than that for the repair job.

As you can probably guess, there is an emotional level involved as well in caring for one's instrument, one almost of responsibility to posterity as well as to the instrument itself. Ostrovsky, groping for the proper words, put it thus: "It becomes a part of you after awhile. You can never stop thinking about it. No matter how much it is insured for, that doesn't matter. This instrument can *never be replaced*. It is itself a work of art. It cannot be duplicated or mass-produced. They no longer know how to make these, you see.

"It's fascinating really," he says, warming to the subject. "They have never been able to recapture the lost technique. Is it the aging alone? Is it the wood? the varnish? Was there perhaps a secret Cremonese formula of varnish-making? No one knows. But we do know that the last of the Cremonese, a man named Ceruti, died about 150 years ago. And with him seems to have died the secret."

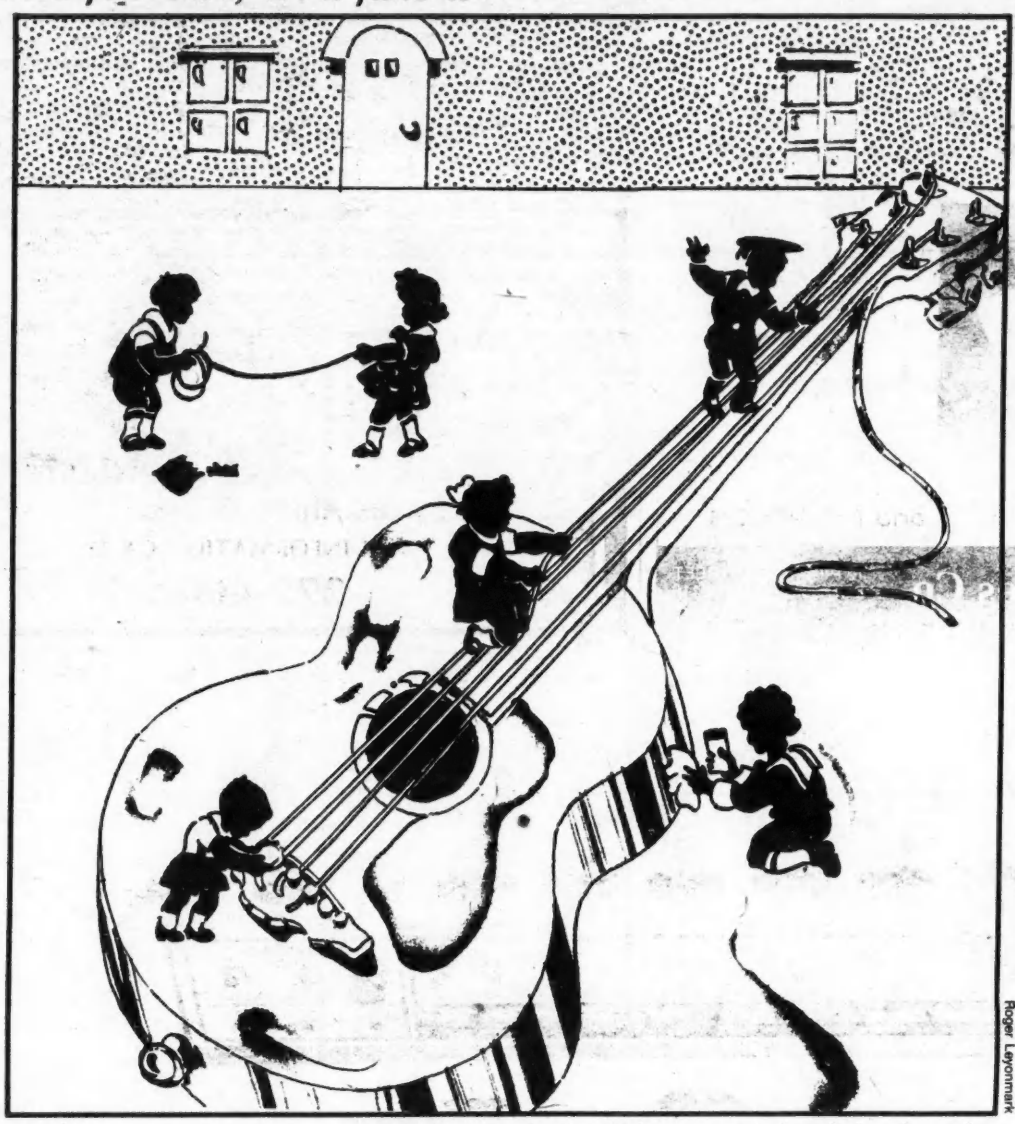
When Ostrovsky goes on the road, he often takes a second violin rather than subject his pride-and-joy to the vagaries of New England's justly maligned weather. If he goes on vacation, he leaves the Guarnerius with a friend who shares his respect for it. And when he tests a new violin out, he goes to a hall.

"More than anywhere else, a great violin will prove its mettle in a huge hall. Whenever one is buying a violin, it should always be tested in such a place. A blindfold test is the best. The musician who is interested in buying an instrument will place three or four of his friends whose musical judgment he respects in different seats in a symphony hall. He will then play three or four instruments, not telling them which is which. A trained ear can always tell which is the finer instrument."

Do You Know the Musical Answers To These 20 Guitar-Playing Questions?

No, but if you hum a few bars, we'll fake it

By Michael Bloom



Roger Leyonmark

"The best you can do for your guitar is to give it a good wipe all over every time you play it to prevent the gook from your hands from building up on the body, neck and strings. The strings should definitely not be ignored, because the acid in your sweat corrodes them. Also, every time you change your strings it's a good idea to polish the whole instrument..."

1. Where can I buy a guitar?

Now that rock and roll has become something for kids to play rather than simply to listen to and live for, the downtown music store, which used to sell about three clarinet reeds a day, now does a land-office business in guitars and accessories. Accordingly, the music store itself is proliferating; there are shops all over the place, with many in the suburbs and even one in the Burlington Mall. These tend to sell knock-offs of name brands.

2. Where can I get a real guitar?

Every place I know where I would consider trading has been in business for at least eight years. As in any other business, the stores that survive do so by building a reputation for quality and service. The real old reliable in Boston is E.U. Wurlitzer's on Newbury Street. And then there's the used market.

3. Where's that?

Just about everywhere. There are shops like Record Garage and Instrument Exchange, both in Harvard Square, that specialize in used instruments. A few pawnshops have gotten into the act, notably Central Sales in Central Square. A number of people try to sell their own instruments through the classified ads in this and other papers, or in publications such as the *Bargain Hunter's Guide* or *Want Advertiser* or by hanging up notices on the bulletin boards at the Berklee School of Music.

4. How much should I be paying?

Since market prices are controlled by supply and demand, one should keep abreast of the instruments available. I find the *Want Advertiser* and the rest to be as valuable as the Dow Jones Industrials in providing average prices. A perusal of their pages also appraises one of such things as the general level of contentment with a particular product — if a lot of something is being sold, you know people are happy with it for some reason.

5. What's the best guitar?

What a loaded question. Gibsons are my particular favorites in the electric field — just about their whole line is worth considering. Fenders are very popular right now because their tonelessness allows them to be distorted and electronically manipulated effectively (and people like Gentle Giant's Gary Green like Fender Telecasters because it doesn't matter how old the strings are). I like the Ovations too, both the electric acoustics and their solid body Breadwinner. Among the imitations, I'm told the Ibanez is reliable.

Martins are the Steinways of the acoustic guitar world and have deservedly become the standard for their roundness of tone. I'm drawn to the warm coloration of Guild acoustic instruments, and the Ovations, though very bright, are also fine. Yamaha instruments are good for the price, but the neck, particularly on the 12-string, may not last.

On the whole, old instruments are better than new ones. I would tend to buy a new instruments only if it incorporates a new feature I want. If you have a yen to buy a brand that wasn't around in days of yore, try to pick one that the quality-control people have gotten all the bugs out of.

6. What do I look for?

You want an instrument to help you express yourself, so your should select one that responds positively to you and feels comfortable to you. If you play to sweat, for example, you don't want a delicate instrument that will wilt under the healt. If you want to be lyrical, you don't want to have to fight for every note.

The determining characteristic in guitar action is the neck. A properly set up neck will be nearly straight — almost exactly straight to the eye — with only enough bow in it to keep the strings from buzzing on the frets. How much bow that is depends on how hard you play.

7. How do I tune it?

Guitar intonation is devised in a system called even-tempered tuning, which means the incongruities in pitch that are inherent in the diatonic scale are evened out so the guitarist can play in any key without bumping into outrageously wrong intervals. I don't favor tuning by harmonics, because that lets all the errors creep back in. The system they describe in all the books — tuning each string to the fifth fret of the one just below (fourth fret for the B string) — is the best. Several players of my acquaintance have bought tuning forks or pitch pipes to use as pitch standards.

8. How do I take care of it?

The best you can do for your guitar is to give it a good wipe all over every time you play it to prevent the gook from your hands from building up on the body, neck and strings. The strings should definitely not be ignored, because the acid in your sweat corrodes them. Also, every time you change your strings it's a good idea to polish the whole instrument with a good guitar polish.

9. Won't the polish build up?

Not if you use a good brand such as Gibson or Martin. The new coat of polish cleans off the old coat and any dirt that might be sticking, and saves the finish of your instrument besides. You're on your honor not to use Lemon Pledge.

10. How often should I change strings?

It should be done (though I realize it rarely is) every 40 hours of playing time. For the average player, this will be about once a month. Some players change more often: Robert Fripp, when he was touring with King Crimson, used to change his strings every two days. Strings start to go bad almost immediately — the breathtaking sonority of a new set doesn't last beyond a couple of hours at best.

11. How about the trick of boiling used strings?

I've tried this, and while it does a pretty good job of cleaning the accumulated crud off the strings, it can't really revitalize fatigued metal — and it's certainly useless when the strings are wearing.

12. What else?

Remember that a guitar is made of wood — a once-living material — and it requires an environment that wouldn't kill you. Extremes of temperature, pressure and humidity — particularly the last — will definitely harm it. (I once took a mandolin from midnight in the Colorado Rockies to high noon in Death Valley — it is now an unplayable wreck.) It is a good idea, especially with an expensive acoustic guitar, to put a humidor in the case — a little doodad that is soaked in water and allowed to evaporate slowly so that some moisture is kept near the guitar to save it from the dryness of central heating. This is especially true in wintertime.

Also bear in mind that a guitar is a pretty rugged thing, but there are certain stresses it was not built to withstand. For example, there is no good to be gained from knocking your guitar over onto a hard floor. Common sense on your part will keep your axe from the costliest

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Guitars

Continued from page 9

of accidents: rather than leaning it on the sofa, put it back in its case.

13. When does it need professional attention?

Sandy Sheehan of Sandy's Music in Central Square says that any imperfection in the guitar (other than a blemish in the finish) should be looked at. A crack in the body, especially in a piece that has been curved, means that the wood is being subjected to stresses it can't take, and it will always get worse.

Also, the parts of the guitar directly concerned with playability may get out of whack. Necks may warp, bridges may need adjustment, the nut may wear and frets may start buzzing. Any time the guitar has to be fought with to play it properly is the time to have it looked at.

14. Can I fix it ?

There are several adjustments you can do yourself, if you're handy with tools and have a good ear for pitch. Many bridges on electric instruments have independently adjustable saddles for each string, and proper adjustment of these should ameliorate any problem with intonation. Administering to a warped neck, however, is not something that is within the competence of the average player. Sandy Sheehan suggests that you take it to a repairman first, so you know what's involved and whether it's within your ken before you proceed with any home repair work.

15. What's the best repair shop?

Again, a loaded question, but I like the aforementioned Sandy's for folk and acoustic instruments, and the lads at Eu-Co Frets, the repair and customizing arm of E.U. Wurlitzer, for electric work. Providence Guitar and Banjo is also one of the very best around.

16. How can I learn more about guitar repair?

Other than by hanging around and digging the shop talk at the above locales, you can pick up on a book called *Complete Guitar Repair* by Hideo Kamimoto, a luthier (guitar builder) who is also interested in the no less important fields of guitar repair and restoration.

17. Can I get my guitar insured?

Yes, and it's a very good idea to have some kind of protection against fire, theft and other hazards, especially if your guitar would be difficult to replace. A premium of about $25 should suffice to protect your investment for three years. See your independent insurance agent.

18. Where can I learn to play?

Any music shop that doesn't have a teaching staff of its own can surely direct you to instructors. I favor teaching yourself once you get the basic chords and picking techniques down, unless you're going into classical guitar or advanced jazz playing, in which case a school such as Longy or Berklee might be better for you than a private instructor.

19. Can I join the musician's union?

The musician's union used to have a bunch of qualifications related to skills like sight reading and transposition, but now that so many musicians have so little formal training in these academic areas, they've relaxed the requirements considerably and will just have you improvise a solo to prove your competence.

However, don't bother to join unless you have to in order to find or maintain work. It costs upwards of $700 to join, and the dues are more than a non-professional guitarist is likely to make.

20. What's a good book on guitar lore?

For a total immersion into every facet of the guitar — history, construction, performance and the total wonder of it all — Tom Wheeler's *The Guitar Book* is probably the definitive work. The text (including articles from the likes of B. B. King) is supplemented with beautiful photographs of many of the finest guitars in use today, which alone make the book a splendid coffeetable item. The research is good, the writing clear and simple (but not without scholarship) and the subject, of course, is fascinating.

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Contemporary American Music Recital for Flute, John Heiss, faculty flautist, performer. Works by Berger, Davidovsky, Hosmer, Heiss, Kraft, Morris. Free.

October 29—Wednesday
7:30 PM, Jordan Hall
New England Conservatory Symphony Orchestra, Gunther Schuller, conductor. A Champagne Concert of works by Berlioz, Rimsky-Korsakov, and Wagner. Reception to follow the performance. $2.00 for adults; $1.00 for students.

November 2—Sunday
8:30 PM, Jordan Hall
Faculty Recital, Gabriel Chodos, pianist. Works by Beethoven, Schumann and Schubert. Free.

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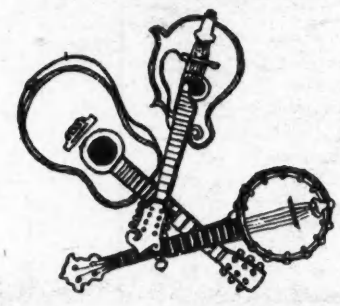

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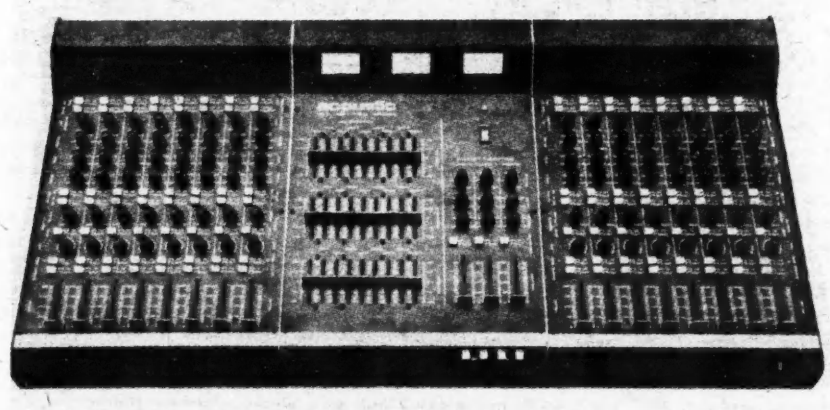

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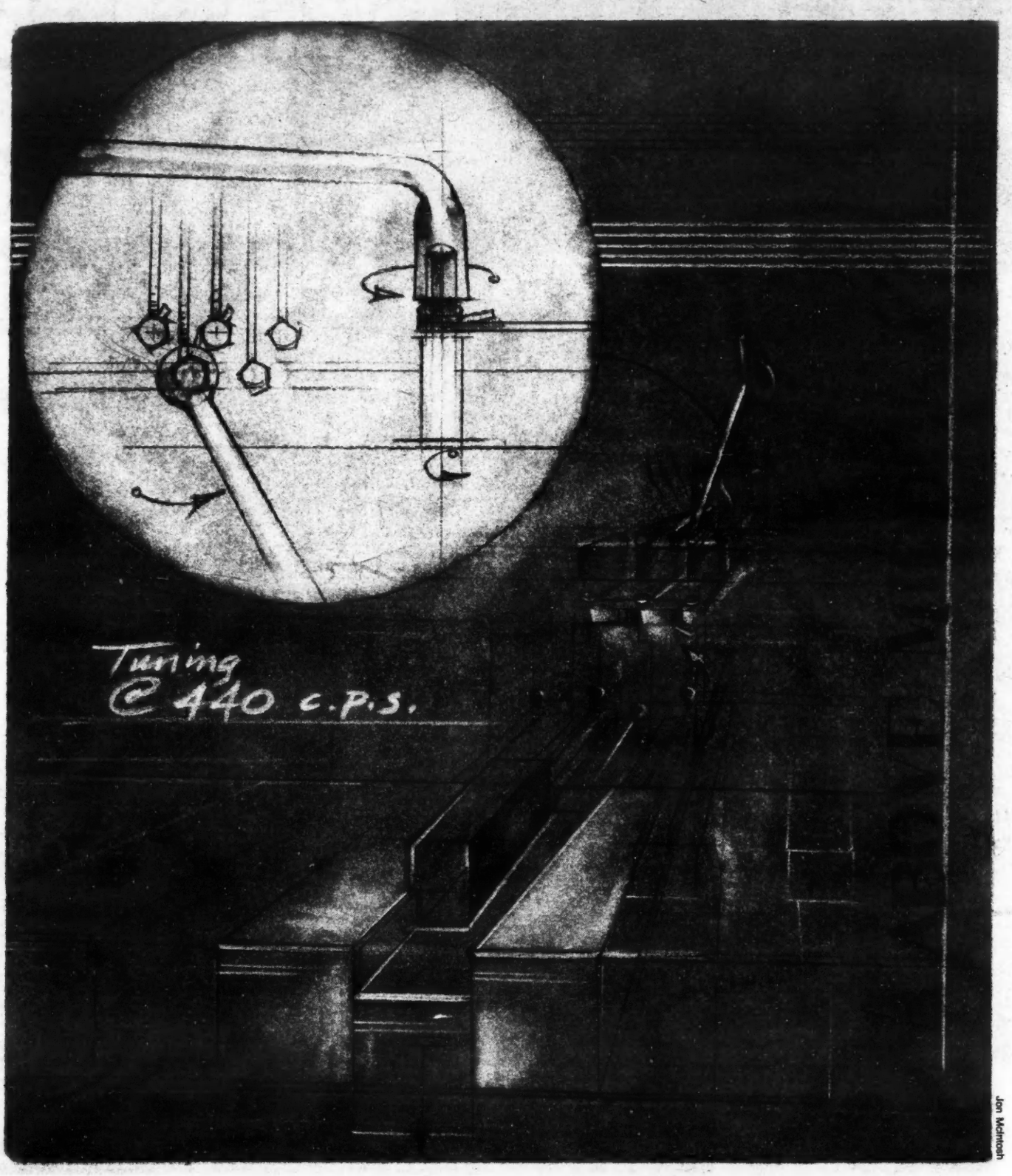

Jon McIntosh

The Well-Tempered Piano Tuner

An expert's note-by-note guide to keeping your keyboard in tune

By Dave Merrill

I don't recommend that you start on your grandmother's fine old Steinway grand, but with patience, practice and a surprisingly small amount of equipment, you *can* tune a piano. Some basic musical knowledge — familiarity with intervals (by sight and by ear) and the ability to recognize when one note is higher or lower than another — is necessary, but you need not have perfect pitch, superior eardrums or divine inspiration.

The tools you will need are: 1) a tuning "hammer" with which to turn the tuning pins (that forest of metal pins at the top of the upright piano and the front of the grand); 2) a tuning fork which sounds the note A at 440 cycles per second (cps); 3) at least four rubber tuning "wedges," which may be substituted by 1½" lengths of ⅜" surgical tubing; 4) a yard of felt ½" to ¾" wide and ¼" thick; 5) a medium-size screwdriver and 6) a piano that won't mind if you break a few strings. The tuning hammer, tuning fork and wedges may be bought at many music stores or at a tuner's supply house (and you needn't buy the best).

With these tools in hand, go to the piano. On an upright piano you'll have to remove the music desk (open the top and see what's happening — in most pianos a couple of hooks hold it on) to get at the tuning pins. You'll see that the wires wrap around all the pins in the same direction; you turn the pin counterclockwise to loosen the wire (lower the pitch), clockwise to tighten (raise the pitch). Find the A above middle C, which is the 440 cps A. Look to see which wires are struck when you play A (there are three) and place a wedge on either side of the A "trichord" (group of three strings), so that only the center string can vibrate. Find the tuning pin around which that string is wrapped and place the tuning hammer head on it so that the handle points left, toward the side on which the wire leaves the pin (on a grand piano the handle should point right).

Strike the tuning fork on a firm padded surface (the heel of a hand, knee, etc.) so as not to damage it and compare its pitch to that of the piano's A. Usually you will find the piano sounding lower than the tuning fork; but *do not* tighten the wire immediately, as it is likely to break. Loosen it first, by pressing the handle of the tuning hammer toward the string, while constantly playing the note, until you hear a lowering of the pitch. Then sound the tuning fork and with it between your teeth (you need one hand to play the note and the other to tune), raise the pitch of the wire until it is just noticeably higher than that of the tuning fork. It is always best to come to the desired pitch from above — the piano will stay in tune much longer that way.

Before tuning down to A, however, you must know what to listen for. By ear you can bring the piano's pitch close to that of the tuning fork, but you must duplicate the 440 cps tone precisely, and the way to do it is through the use of "beats," or waves which occur in the sound. If the tuning fork sounds at 440 cps while the string is vibrating at

Continued on page 14

David Merrill, who has been tuning pianos professionally for nine years, typeset this supplement.

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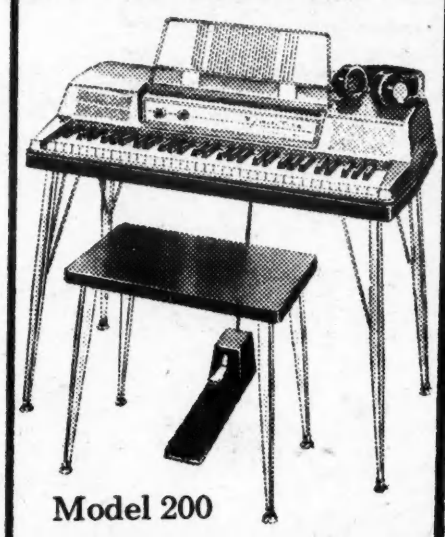

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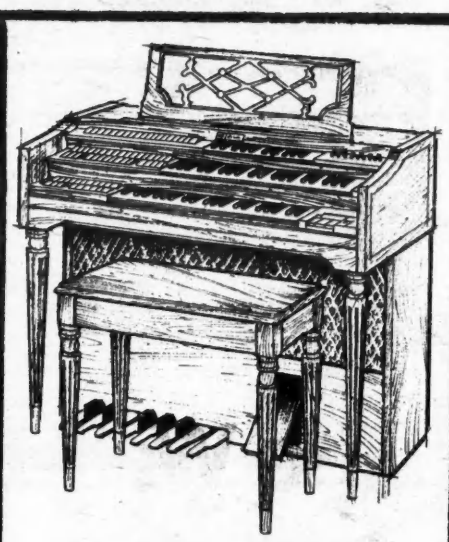

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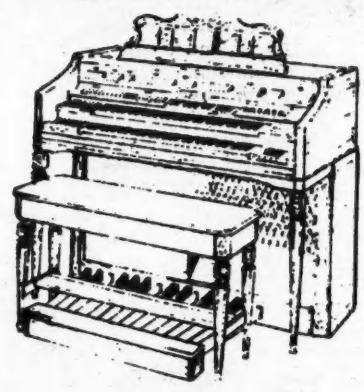

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Tuning

Continued from page 12

441 cps, the audible difference in pitch is so small that you might not recognize it. But the two sounds are superimposed on your ears — not as two notes, but as a composite sound — and once every second the 441 cps tone will "pass" the 440 cps tone, which causes a movement in the composite sound. At the beginning of a given second, the two sets of sound waves will move the air together, reinforcing each other, but after half a second they will be vibrating against each other (out of phase), which causes the composite sound to be quieter. By the end of the second, the two sounds will again vibrate in phase, making the composite sound loud again. The result is a wave or "beat" in the composite sound once every second. If the difference between the two tones is two cps, they will beat against each other twice each second. (If the difference between the two tones is 100 cps, a third tone called the "difference tone" will sound very quietly at that frequency — but that's another ballgame.) So as you tune the A-string near the pitch of the tuning fork, you will hear beats — first fast, then more slowly as you come down toward the correct pitch. The object is to tune the string so that it does not beat at all against the fork. Then you have duplicated the pitch of A 440.

To accomplish this on the piano, press the handle of the tuning hammer toward the string — gently at first — and strike the A-note very hard as you do, with the tuning fork vibrating loudly between your teeth. If the pitch of the string does not change as you press the hammer and strike the note, increase the pressure slightly and continue striking hard. Eventually, the pitch will change — though it may happen all at once, and too far. Then it will be necessary to bring the pitch back up and try again and again, until you reach a smooth, sustained sound without beats.

The phenomenon of beats can be used to relate other notes of the piano to this first one. In order to do this, you must realize that the fundamental pitch that you hear on a single string is not the only sound occurring. The string actually vibrates at the fundamental frequency *and at all even multiples of that frequency* — twice, three times, four times and five times the fundamental frequency, and so on. These secondary vibrations are known as the "harmonic series," and in terms of musical intervals, this series is the same for every string on the piano. Twice the frequency of the fundamental pitch is the second harmonic, which sounds an octave above the fundamental. Three times the fundamental frequency sounds a fifth above the second harmonic, and four times the fundamental sounds a fourth above that, or two octaves above the fundamental. The fifth harmonic (five times the fundamental frequency) sounds a major third above the fourth harmonic; the sixth harmonic sounds a minor third above that, the seventh a minor third above that, and the eighth a major second above that (three octaves above the fundamental). Thus, when you play the C below middle C, you hear that note *plus* middle C, G above middle C, C above middle C, E above that, G above that, Bb above that, C above high C, D above that, and so on. And when you play G below middle C, you also hear G above middle C, D above high C, G above high C, B above that, D above that, F above that, and G above that. (The relative intensities of these harmonics are what determine the "tone" of the note.)

Notice that between the C and the G below middle C, there are three harmonics common to both notes — G above middle C, G above high C and D a fifth above that. In the same way that you hear beats when the tuning fork and string sound at nearly the same frequency, so you can hear beats at those three pitches when C and G are played. In that way you can control the relationship between G and C by regulating the speed of the beats between their harmonics. That is what we aim to do.

The range in which we shall do it is the octave from F below middle C through E above it. Using the screwdriver, push the felt strip between the trichords of that octave, so that only the center strings can sound. We shall begin by tuning the A below middle C, whose second harmonic coincides with the fundamental pitch of the 440 A, so that in comparing these two notes, you will hear beats at the pitch of the higher A. Do not forget to *loosen the wire* until you hear a change in pitch. This must be done on every note; it assures that you won't break the string, and it also tells you whether you are turning the correct tuning pin for the note you are playing. Then tighten the string until it is just noticeably above the desired pitch and come down, pressing the tuning hammer toward the string and striking the note hard, until you hear the beats slow and eventually stop.

At this point we must introduce the concept of temperament. In matching the common harmonics of any two notes, "beatless" will never be the correct relationship except in the case of two strings on the same note. The reasons for this are too complex to explain here, but even the interval of an octave, which seems so pure, must be "tuned out of tune" very slightly (and in the extreme treble quite harshly) for the overall sound to be right to the ears. Other intervals require varying degrees of temperament, some on the "wide" side of beatless (*i.e.*, the bottom note lower or the top note higher), others on the "narrow" side (*i.e.*, vice versa). The goal is "equal" temperament, which compromises each interval in such a way that similar intervals will have similar sounds, and a piece of music may be played in any key with no loss of sweetness.

Thus, you must tune this A slightly flat (widening the octave), about one beat every two seconds. Approximate that temperament and go on — you'll likely be back to correct it anyway. Just make sure that it beats on the *flat* side.

Now move on to the E above that A, and after the preliminary loosening, compare this E with the A you just tuned. Looking at the harmonic series of these two notes, you will find common harmonics at E above high C, the E above that and the next higher B. You need only be concerned with the two lower ones. Raise the pitch of E while playing the fifth A-E. The interval of a fifth must be tuned "narrow," which means that you will tune E slightly below the beatless point. How far below involves a little balancing act. Start out by tuning E beatless and, listening to the second common harmonic (three-line E above the staff), lower the pitch to give a beat rate of about four every three seconds. When you get somewhere near that, compare E with the 440 A a fourth above it. The common harmonic of that interval happens also to be three-line E, and it should beat at the same speed as that of its inversion. If you cannot cause this to happen, you will have to adjust the tuning of the lower A until you can. If the fourth E-A beats slower than the fifth A-E, widen the octave A-A by lowering the bottom note. If the fourth beats faster than the fifth, raise the bottom note, but it *must* remain below the beatless point. Retune the fifth on the narrow side of beatless and compare the A-E and E-A speeds again. That three-line E should beat somewhere between one and two beats per second in both intervals, at whatever actual speed they will agree on.

(In the beginning it is often useful, if you are having trouble hearing the beats, to speed them up so they are more pronounced by putting the note more out of tune, and find them by actually playing on the piano the common harmonic you are trying to hear and then listening for movement at that pitch in the interval you are trying to tune.)

With E in tune, we are in the ballpark. Move on to B (within the designated octave) and, comparing with the E you just tuned (*after* loosening to avoid breakage), bring the pitch above and then down to beatless. This fourth (and all fourths) should be tuned wide, so you will tune B slightly below the beatless point. The common harmonic, B above high C, should beat just noticeably slower than the E-A fourth, and that is about as precise an instruction as can be given until you have tuned a few more notes. Settle on something and move on to tune F# in the fourth F#-B. The beat (again on the wide side) of the common harmonic, F# above high C, should compare with the fourth B-E as B-E compared with E-A. When you have approximated this condition, move on again. Tune C# in the fifth F#-C#, again on the flat side of waveless (narrow fifth), so that it beats hardly noticeably slower than the fifth A-E.

Now we have enough to test the work. The primary test at this point is the comparison between the major third A-C# and the minor third F#-A. Their common harmonics are quite high, and their beat rates are in the range of a shiver. You cannout count the beats (8-10 per second), but the texture is quite clear, and the minor third F#-A should beat only slightly faster than A-C#. If this is not the case (and it's not likely to be the first time), you'll have to go back and begin the process of readjusting the speeds of the fourths and fifths to produce this condition. The analysis of the problem will be helped by the knowledge that the major third is beating on the wide side, so that if A-C# is faster than F#-A, you must retune B, F# and C# to give slightly faster beat rates, thus lowering C# and slowing A-C# — but *each interval must beat faster than similar intervals below it and slower than similar intervals above it*. Conversely, if A-C# is drastically slower than F#-A, you must raise C# by slowing the beat rates of B, F# and C# in their respective fourth and fifth intervals. (Do not change E in this adjustment — it is locked between the two A's.)

Having finagled and cursed these conditions into existence (so that A-C# shivers only slightly slower than F#-A and all the fourths and fifths are properly in line), tune G# in the fourth G#-C#. The fourth should, again, be wide, and its beat rate should fall between those of F#-B and B-E. When that is somewhat the case, test the minor third G#-B to see that it beats slightly faster than F#-A. If G#-B is too fast, you may slow it by speeding up (widening more) the fourth G#-C# (since the minor third beats on the narrow side). But you must be sure the fourth beats at a speed between F#-B and A-E.

Go on to tune D# in the fifth G#-D#. Its beat rate, on the narrow side of beatless, should fall comfortably between those of F#-C# and A-E. In addition, the major third B-D# should beat at the same speed as the minor third F#-A (which is slightly faster than A-C#, if you haven't cheated). This being the case, tune A# in the fourth A#-D#. Tune it below the beatless point, so that its beat rate falls between those of G#-C# and B-E. Its test is the comparison between the major third F#-A# and the major sixth F#-D# — they should beat the same. Assuming that they do, tune F in the fourth F-A# to be (need I say it?) wide so it beats just slower than F#-B. The test, which often brings a tear to the eye, is comparison between the major thirds F-A and F#-A#. They should, of course, beat at nearly the same speed, with F-A lagging if either does,

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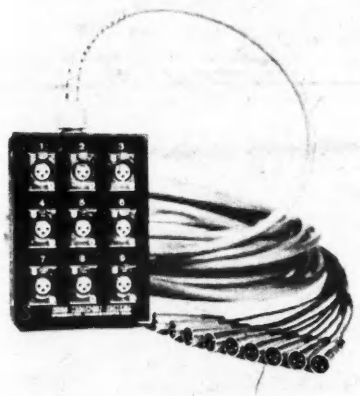

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Players' Choice: What To Look For When Buying

Buying a good piano is no easy task, and finding one within a reasonable price range is even harder. If you have $5000 to spend, a thoroughly rebuilt Steinway grand is the best bet (safer than a new one); for $500, a turn-of-the-century upright with a sound sounding board and rust-free wires will probably work out OK with a good tuning job; for $50, forget it. You can expect to pay at least $300 for the basic playable piano, and that may go up greatly if it has to be moved into a high-rise apartment. Movers charge at least $50 and about $20 per floor for the block-and-tackle hoist. But no rules are hard and fast ones since luck might locate a free piano in good condition — and if your friend has a truck, and you live on the first floor. . . .

Generally, piano experts advise prospective buyers to look in the classified ads, and depending on your own knowledge, take a tuner or piano rebuilder with you to check it out. Reputable second-hand dealers can also be trusted to tell the truth about the condition of the instrument they are selling, and the best way to find a reputable dealer is by asking a tuner or pianist friend. In any case, if you are not familiar with the innards of the instrument, $15 to $20 will cover a professional appraisal of its merit.

External beauty is deceptive; chipped ivories can be repaired (and Russell Grethe in Newton is great at fixing them), and a dilapidated cabinet may sometimes hide a gem of an instrument. Again, though, a beat-up piano has probably been internally abused too, so particular scrutiny is recommended.

If you do not have a tuner or other expert handy to shop with you, tips for eliminating real junk include first listening for buzzes or rattles in the sound (which can mean a cracked sounding board). A severely broken board is a no-no, since replacement costs about a thousand dollars and few rebuilders do the job (David McCord of Cambridge is one of the rare craftsmen in this area who does). Slight cracks will not necessarily ruin the sound and, on a less expensive piano, can be tolerated.

Next, lean on all the keys at once and see if the sound stops when you pull away. If so, fine; if not, that could be trouble, meaning that the dampers are gone. Check every key individually to see if the note sounds repeatedly when struck, a sure sign of wear. The note should continue as long as the key is pressed down.

On the inside, the wires should be relatively free of rust, because if they have to be restrung, it's several hundred dollars, and the copper can't be cleaned. The tuning pins along the top of the wires should be tight and should have at least one-eighth of an inch between them and the back plate or they will be too worn to hold a tune. Make sure there is no debris, like hairpins or matches, inside the piano or between the keys. If you are hearing two different notes when pressing one key, debris may be the source of the trouble and can probably be easily fixed, but if two hammers are striking simultaneously, it could mean costly repair.

Shopping for brand names is sensible if you are spending thousands of dollars on a new grand piano. But if your pocketbook holds $2000 or less, the manufacturer doesn't matter since thousands of different makers produced excellent pianos 50 to 100 years ago, and many of those, reconditioned, are still in top shape or could be, with a tuning or minor repairs. New pianos are not as well made as the older ones, for predictable reasons: decline in craftsmanship, substitution of materials (such as teflon action centers instead of felt) and rising costs of parts and labor. A perfectly rebuilt old piano will be worth more money than a comparable new one. Yamaha does make good, new uprights, and Steinway is still highly rated for grands, although some pianists say Baldwin is better.

Not only price, but purpose should determine the type of piano bought. A well-reconditioned upright, for $800 to $1000, would be adequate for a casual player or beginning music student, but these are difficult to find. If the piano is in good condition, and in that price range, it's snapped up quickly — at least in this area. If it's been on the market awhile, that means it probably isn't such a good instrument; or if it is really good, it's out of the middle price range and beyond the financial means of most players. Gamelin's Piano Service in Cambridge and Somerville's Acme Piano Sales are reliable places to find middle price range pianos that have been properly rebuilt. David McCord specializes in sales of Steinway grands which he has totally rebuilt and also repairs pianos. He suggests a customer take a piano rebuilder to look over a potential purchase, and a sure guideline to the condition of the instrument is the seller's willingness to let it be examined. "If the owner or salesman is at all nervous about having a technician examine the piano, you can write it off immediately," says McCord.

From spinets to concert grands, the selection process can be treacherous. Advance advice from an expert is a worthy investment; no two pianos are alike and quality among brands differs widely. And even an expenditure of a couple of hundred dollars is a painful loss if you wind up with a lemon. **—Nancy Pomerene**

and the same should be true of F-G# and F#-A. If everything has checked out beautifully up to this point and these thirds still don't line up properly, you might allow yourself a small fudge on the last two fourths (A#-D# and F-A#) to put them right, though the proper procedure would be to go back and retune the whole blasted scale (except for A and E), with an eye toward producing major thirds with (if F-A is too fast) faster beats or (if F-A is too slow) slower beats. Usually, a quick glance at my watch solves this dilemma for me.

Go on, then, and tune C in the fifth F-C, which should be narrow by an amount which you must be getting the hang of by now, and test the major third G#-C to be sure it's just below A-C# in speed, and a bit above F#-A#. Test also the major third C-E (a real favorite) for its superiority over B-D#, and the minor third A-C against its companions on either side.

Now tune G in the fourth G-C, properly wide, and test the major third G-B to see that its beat rate is between those of its neighbors, and that it is identical to that of the sixth G-E, which should be almost imperceptibly faster than F#-D#. And finally, tune D in the fifth G-D, below beatless and to the left of G#-D#, and have a cup of coffee.

If you have taken care in tuning this first octave, the rest should go relatively smoothly. What is left is to duplicate this central chromatic scale over the rest of the piano and then to tune the outside strings of each trichord in perfect, beatless unison with the center string. I have explained that octaves must be widened, especially in the extreme treble. Experience is the best teacher of how much they should be widened, but there are some guidelines that can be given.

Both above and below the central octave, it is a good practice to tune each note in relation to the tuned note a fifth away. Tune the fifth waveless, and then compare with the tuned note an octave away. You will find that the octave is too wide, and you must split the difference between the fifth and the octave to give an "acceptable" rendition of both. This applies as high and as low as you can hear the interval of a fifth.

In both treble and bass, the interval of a tenth may be used as a test, and in extreme treble and bass the octave tenth is useful. It must be remembered that each interval should be slightly faster than the similar interval below it. Tune octaves — and fifths when you can hear them clearly —

Continued on page 18

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Still Harping on the Same Old Chords

Boston's harpsichord makers are designing oldies but goodies

By Clif Garboden

If you put all the major harpsichord manufacturers in one room, we'd either all be very quiet or leave with blood on the floor.

—William R. Dowd

You wouldn't think that harpsichords would be controversial. Trombones aren't controversial — they either play in tune or they don't, fall apart or stay together, all in a very obvious and straightforward manner. It's given that some trombones are better than others and the ranking is pretty established. You'd think all instruments would be like that.

Why is it, then, that the first thing we learned from Boston's harpsichord makers was that anything said in print about the manufacture of these ancient stringed instruments would inevitably provoke uncontrolled hostility from one quarter of the industry or another?

Harpsichords are, well, inestimable. Which is to say that there is a lack of universally acknowledged standards against which a given instrument can be measured. The first harpsichords were built some time in the 1500s, and the bulk of existing literature for the instrument was composed over the subsequent two centuries, after which point people started inventing pianos and the harpsichord was banished from the stage. It wasn't until around 1900 that performers rediscovered the old music and put the harpsichord back in production again.

Clif Garboden

Addison Lee tests one of the Dowd harpsichords.

Unfortunately, most of the early 20th century harpsichord manufacturers started from scratch. The surviving instruments were all in a state of decay, so the highly inventive minds of the early 1900s set out to reinvent the piano's predecessor in the cumbersome likeness of, of all things, the piano.

Any harpsichord fanatic will tell you that comparisons between those two instruments are dangerously misleading. Like pianos, harpsichords have keyboards, although most harpsichords have two (covering a 61-note, five-octave range) and the facing is reversed — black naturals and white sharps. Both harpsichords and pianos have strings and the shapes are similar, but there the relationship ends.

Pianos are by definition percussion instruments — sound is made when a small hammer taps the strings of a given note. Harpsichords, on the other hand, are true string instruments. The action of harpsichord keys causes a short tongue of wood — raven or vulture quill (in the original models) or plastic (called quills) — to pass by the strings and pluck them. The plectrum (the plucking mechanism) then falls back to its rest position, and a small pad damps the string immediately. This action gives the harpsichord its characteristic sharp, thin sound.

On pianos tone color and characteristics are controlled by the performer's attack and by foot pedals. But typical harpsichords have three strings assigned to each note and two keyboards. A full double harpsichord has two sets of eight-foot strings (named after the eight-foot "C" pipe on a pipe organ to which they are tuned) and one set of four-foot strings (tuned an octave higher). Combinations of these strings are engaged and disengaged by means of manual stops. On most two-keyboard harpsichords, one keyboard plays a single eight-foot set, the other an eight and a four. Again by stopping, it is possible to engage both keyboards so that one plays the other and you can take advantage of the full two-by-eight-foot plus one-by-four-foot voicing.

The arrangement is simple in principle, but temperamental in nature, requiring frequent tuning and careful attention to uniform dynamics during the manufacturing stage. The early 20th-century designers, haplessly ignorant of Baroque-era technology, contrived many ill-sounding musical contraptions in their attempts to stabilize their instruments.

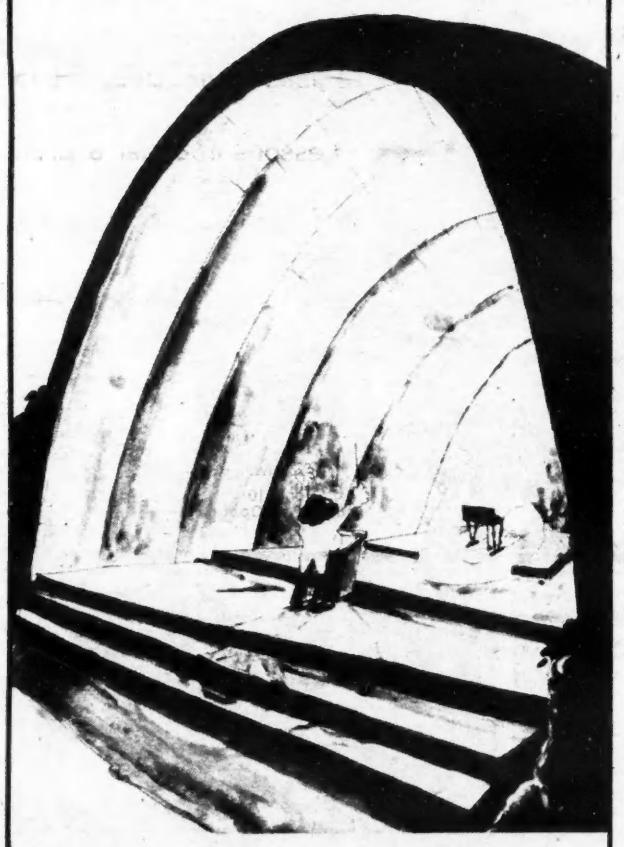
It wasn't until the late 1940s that serious music historians, among them two Harvard students named Frank Hubbard and William Dowd, began to suspect that the 16th-, 17th- and 18th-century instrument-makers were smarter than the unplayable condition of their legacy suggested. These "classicists" then abandoned the new European harpsichord technologies and embraced the designs of the antique French, Italian and Flemish instruments.

And that's where things stand today. Some people, mostly Europeans, are still turning out "new" harpsichords. Others, primarily in Boston (known in the trade as the Antwerp of the 20th century), are handcrafting classical copies of Baroque-period instruments, all of which, as you might suspect, were not identical. And that's where much of the controversy originates. There are a number of 300-year-old harpsichords stashed in museums and private collections around the world, but most of them are deformed or broken and obviously nobody remembers what they sounded like.

Clever people like Messrs. Hubbard and Dowd, however, have developed an eye (and ear) for restoring these antiques and picking up clues about old performing techniques and the instrument's functions from the original music written for the harpsichords. But basic questions remain concerning authenticity, quality and the importance of various materials

Continued on page 18

Conduct an Arp



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Play It As It Sips

How to make instruments out of straw

Musical instruments, like empty parking spaces, are where you find them. I was at a party last week where 23 people, simultaneously struck with an uncontrollable urge to make noise, simply foraged around the room and found plenty of improvised instruments. One ambitious fellow tackled the woodpile next to the fireplace and managed to "tune" several logs for a primitive xylophone. I was content with rhythmically slapping a stale peanut butter and jelly sandwich on a counter top. Everyone knows the trick about blowing across the top of a beer bottle, although few are experienced enough to know that if you tighten your lips and blow twice as hard, you get a note twice as high and twice as irritating.

All this is fine, if that's what you like to do at parties, but the art of homemade music needn't stop with the obvious practice of abusing common household articles to make percussion. With little effort and almost no patience or skill, anyone can fashion simple, inexpensive and poor-quality wind instruments with which to delight and alienate friends.

The basic theory behind such devices is the same used to design recorders, oboes and clarinets. Your first step is to believe and internalize the following hideously simplified statements: 1) things make noise then they vibrate (guitar strings, for example); 2) vibrating things make noise because they vibrate the air around them; 3) you can make different sounds or notes by vibrating different things (like long or short guitar strings); 4) wind instruments work by vibrating a column of air and 5) different length columns of air make different notes when they vibrate.

Got that? Now consider the clarinet you gave up on back in junior high. Most of the time it just squawked and squeeked, but on good days it made music. How? Well, clarinets have reeds and when you blow air at the end of them, they vibrate and in turn cause the column of air below them to vibrate and produce a note. Clarinets have holes all up and down their bodies. Opening and closing these holes in the right order changes the length of the column of vibrating air which thus changes the note.

That's all there is to it. Obviously, with clarinets all this column-of-air changing is fairly scientifically computed so that all the clarinets in the world play more or less the same notes. But without a lot of brains you can apply the basic clarinet theory to your basic plastic drinking straw and make a woodwind instrument that works, though not as well as a clarinet.

You will need: one plastic drinking straw, teeth, one pocket knife and a cigarette. Begin by sticking the tip of one end of the straw in your mouth and closing your teeth on it about a half inch down. Draw the tip out through your clenched incisors. Repeat this gross procedure without rotating the straw until the tip is flat and flexible. Now take your knife and slit the chewed end along the crease about three-quarters of the way down the flattened section. *Voila!* You've just made a "double reed" somewhat like the ones on oboes.

To play, cover your top teeth with your upper lip and your bottom with your lower lip and put the reed into your mouth just far enough so it disappears. Now blow. With practice you'll be able to get the reed vibrating and you'll hear a note. In musical circles this note is called your "fundamental" — the whole column of air vibrates.

Roger Leyonmark

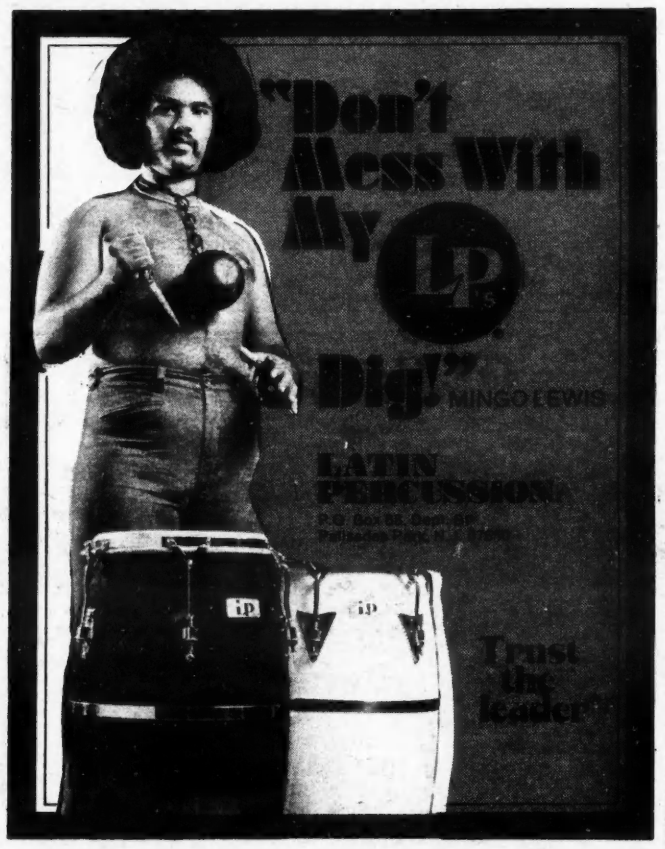
Next, measure your straw. Locate the point halfway between the slit in the reed and the bottom. Take a cigarette and burn a small hole exactly at this point. Now play the thing and you should have a note that's one octave (or eight notes counting the first) above your fundamental.

To get a full scale, you'll have to burn more holes between the mid-point and the bottom. It's tempting to space them evenly, but that won't work. Here's the all-important formula: measure from the octave hole (midway) to the bottom and divide that number by eight. Call your answer "x," or call it "Harold." I don't care. Measure two Harolds from the bottom and burn a hole in the straw. Measure up one Harold from that and burn another; one Harold up from that and burn another. Now measure up *two* Harolds and burn a hole, then up one Harold and burn a hole. If you measure up one Harold from this, you should meet your octave hole. Good luck.

From the bottom, that's two-x, one-x, one-x, two-x, one-x, one-x. Now cover the holes with your fingers. Blow through your reed and uncover them one at a time in order from the bottom. If you're lucky, you have just played a scale.

The joy of these instruments lies in experimenting with them and advancing their design. Use other materials, like an automobile fuel line with a plastic straw reed (cigarettes won't work unless you use a VW fuel line). Cardboard tubes are good, but don't choose anything too long or too wide or your fundamental will be too low to play with the little reed.

Incidentally, all such instruments sound absolutely terrible, and it's generally considered a total waste of time to make them. But some of us are easily amused. **—Clif Garboden**



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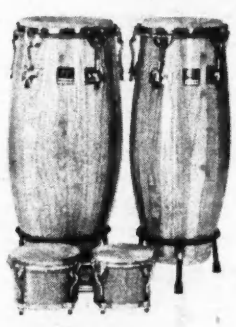

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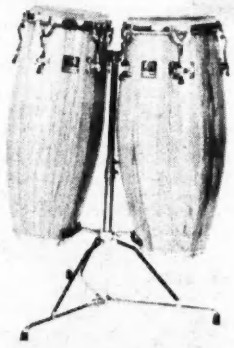

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Harping

Continued from page 16

used by the early manufacturers. For people who like to argue, the opportunities are limitless.

William Dowd attributes much of the constant debate to petty extremism. "Most of the great ongoing controversies are about the number of angels that sit on a pin .... I always tell amateur builders to go and find a good antique instrument and copy it. I tell them, 'Even if you don't know what you're doing, he [the original builder] did.' However, as a result of this attitude, people have developed a classical orthodoxy that approaches religion. Some builders believe that a harpsichord has to be a copy. Even if the original builder made a mistake, they copy the mistake. . . .

"When I'm working on a French harpsichord, I pretend that I'm living in the 18th century in Paris. I work in classical *traditions* [as opposed to making exact copies]. This can be dangerous, but I believe that making a precise copy can't produce a masterpiece. The majority of the Dowd instruments are *mine*."

Says Dowd craftsperson Addison Lee: "Some people just love antiques and think that an instrument isn't a true replica unless it's broken. A plectrum sticks during a concert and the performer pulls it out and says, 'Ah, these antiques,' which engenders an attitude in the audience that only a broken harpsichord is authentic or valuable."

*

Frank Hubbard and Bill Dowd went into the harpsichord business together during the '50s. The Tremont Street firm of Hubbard and Dowd produced half a hundred "replica" instruments and specialized in restoring valuable antiques from around the world, including some from the Smithsonian collection. Both Hubbard and Dowd are still in business, but separately. Hubbard went off to Europe to study antique construction and his research produced *Three Centuries of Harpsichord Making*, the harpsichord builder's bible. Now he operates his own shop in a barn on the grounds of the Waltham estate where he lives. The barn shop employs three full-time craftspeople, and, according to Hubbard business manager Larry Erdmann, turns out approximately 10 harpsichords a year.

Hubbard also manufactures harpsichord building kits, which sell for around $1500. Kits include all the necessary wooden parts (60-70 total), keys, strings and ornamentation to build your own 18th-century French harpsichord.

Hubbard kits are available in various stages of completion, ranging from your basic tinkertoy variety consisting of a box of pieces and an instruction book (100 pages) to a less ambitious package containing a preassembled body and loose hardware and musical parts. Larry Erdmann claims that such a kit can be assembled in five to six months of spare-time work. Finished Hubbard harpsichords take three to four men months of work at the factory. The sign in the Waltham wood shop reads "It's Hard Work Making Harpischords" (the old spelling). Which is probably true, but Hubbard sells 300 kits a year.

Bill Dowd runs one harpsichord shop on the fourth floor of a warehouse in the Lechmere section of Cambridge and another, smaller shop in Paris which he set up to help the French make French harpsichords.

Though no longer partners, Hubbard and Dowd share their knowledge and technical advances openly. They compete for prestige rather than money. Says Dowd: "Frank and I didn't split up over any basic artistic differences. We just each wanted to work individually without holding a board of directors meeting every time we had to decide where to put a wood screw."

Neither firm is hurting for customers. Hubbard or Dowd harpsichords sell for around $8000, and there is a four-year backlog of orders. In addition to Hubbard and Dowd, there are literally hundreds of small, one-person harpsichord shops scattered throughout the Northeast. These little companies make only one or two instruments a year, and their owners most likely served an apprenticeship in Waltham or Cambridge. It's these Hubbard/Dowd "children" who keep the industry stirred up.

"A lot of what people worry about is foolishness," says William Dowd, but he admits that the controversy has made "the leading manufacturers pay attention and work harder."

Tuning

Continued from page 15

and test with tenths. The major sixth is also a good test in the high bass and low treble, and the major sixth above a note should beat the same as the tenth above that note.

In case you would like to look at beat rates mathematically, there is a number which allows rough calculation of the frequencies over the whole piano keyboard. If you multiply the frequency of a note by 1.0596431, the result is the frequency of the next higher note; division by that number gives the frequency of the next lower note. If you start with A as 440 cps, you can determine all the frequencies and compare them with multiples (harmonics) of other frequencies to discover the beat rates at various common harmonics. For example, the frequency of middle C thus calculated is 261.22 cps. Twice that frequency gives the second harmonic, 522.44 cps. Yet the high C calculates as 523.52 cps, so it appears that the beat rate, in tuning the octave from middle C to high C, should be the difference, 1.08 per second. This works in practice, though it varies slightly from piano to piano and cannot be counted as exactly 1.08 on the job (one beat per second will do). An octave higher, the beat rate will be twice that; and an octave higher, twice again. As you experience piano tuning, you will be amazed at the extreme amount of octave stretching required for a good match between the very low and very high notes.

Of course, if all this sounds confusing the presence of a skilled tuner will be of infinite help in setting these ideas solidly into practice. In any case, good luck to yer.

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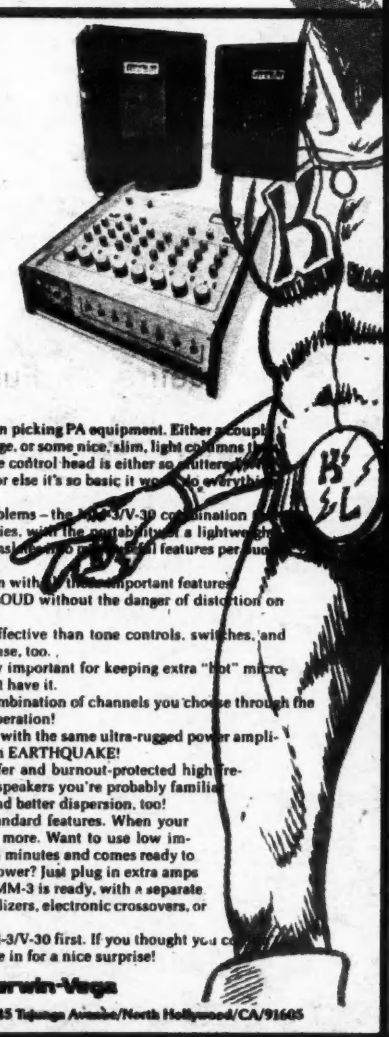

If playing clubs is your gig, you know the choices you face in picking PA equipment. Either a couple of monster cabinets that weigh a ton and take up half the stage, or some nice, slim, light columns that unfortunately are a little lightweight on sound, too. And the control head is either so cluttered with gizmos that it takes five minutes to find the volume knob, or else it's so basic it won't do everything you need it to.

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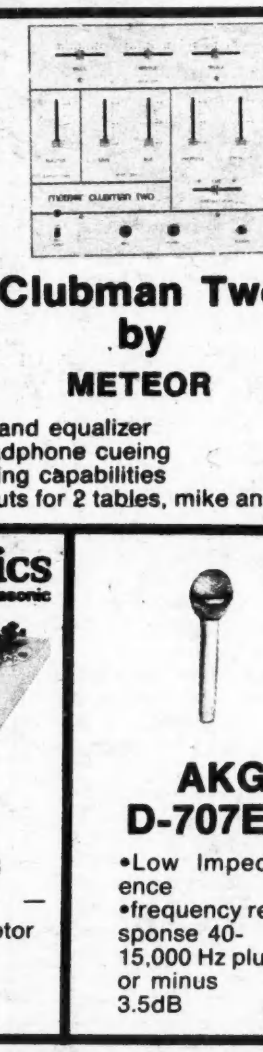

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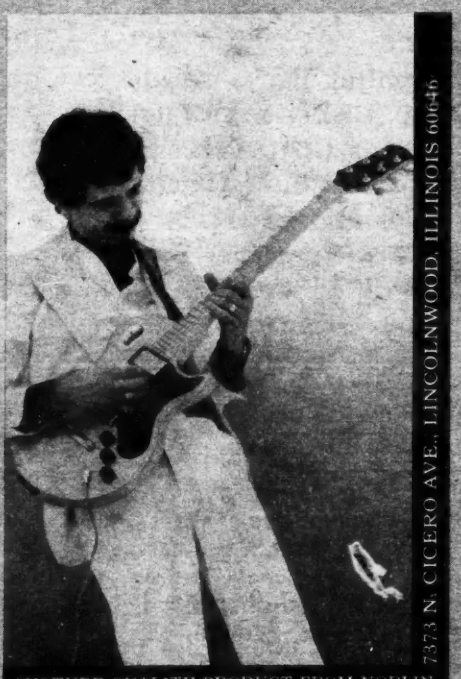

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